Asset Price Dynamics with Heterogeneous Beliefs and Time Delays

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Certificate

I certify that this thesis has not previously been submitted for a degree nor has it been submitted as part of requirement for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Signed .....

Date .....

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Contents

Abstract

With growing populations, the size of economies, and technological innovations, financial markets are increasingly becoming larger, more diverse, complicated, and volatile. Shocks from one market can propagate very quickly to other markets, as we saw with the global financial crisis (GFC) and the ongoing spill-over effects of the European sovereign debt crisis. These changes have had a profound impact on investor behavior and financial market and pose a great challenge to traditional asset pricing theory based on rational expectations and the representative agent paradigm. Over the last three decades, empirical evidence, unconvincing justification of the assumption of unbounded rationality, and investor psychology have led to the incorporation of heterogeneity and bounded rationality into asset pricing and financial market modelling.

This thesis contributes to the development of this literature by modelling boundedly rational behaviors, including trend chasing, herding, and adaptive switching, and examining their impact on various types of market behaviors such as price deviations from the fundamental values, excess volatility, and spill-over effect, which are then explored to explain momentum and reversal effects, two of the most challenging anomalies to finance theory in financial markets. This thesis has four main contributions.

(i) Different from the discrete-time heterogeneous agent models developed in the literature, the thesis provides a unified approach in a continuous-time framework to study the effect of trend chasing based on historical price information and explore different mechanisms and impact of trend chasing, herding and switching on various market behaviors (such as market booms and crashes, long deviations of the market price from the fundamental price), the stylized facts (such as skewness, kurtosis, excess volatility, volatility clustering and fat tails of returns), and the long range dependence in return volatility, which are widely observed in financial markets. This is the focus of Chapters 2 and 3.

(ii) It provides market conditions on the momentum profitability, which underlies the time series and cross-sectional momentum effects well documented in empirical lit-

erature. This is the focus of Chapter 4.

(iii) By applying the latest mathematical theory on the maximum principle for control problem of stochastic delay differential equations (SDDEs) to a geometrical Brownian motion of asset pricing with momentum and mean-reverting effects, Chapter 5 provides an optimal investment strategy that can outperform not only the pure momentum strategy and pure mean reversion strategy, but also the stock market index.

(iv) It develops an evolutionary CAPM and shows that rational switching behavior can destabilize the market and generate a spill-over effect, which is associated with high trading volumes characterized by significantly decaying autocorrelations of, and positive correlation between, price volatility and trading volume. This is the focus of Chapter 6.

Overall, this thesis shows that asset pricing models with heterogeneous beliefs and boundedly rational behaviors can better explain the mechanisms which generate various financial market behaviors and market anomalies.